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7 September 1982

MEMORANDUM FOR THE RECORD

SUBJECT: Meeting with DCI on 3 September

Comments on NIEs:

-- The DCI wants each estimate to be followed up by a statement for collectors regarding collection needs and collection gaps -- this statement ideally should be cabled to appropriate station -- it should also be circulated in Washington and perhaps tabled at the next warning meeting.

-- The DCI complained that the TORs are too general -- he feels they should list the questions to be answered "lay out the crunch questions" -- "be more exacting."

In some cases portions of the warning reports can profitably be sent to field stations. DDO attendance can probably be expanded.

David D. Gries

cc: A/NIO/EA
Warning File NARC
DCI File

DHS Review Completed.

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DEC - 8 1981

Program Standard for Drug Interdiction

G-OLE-3, Plans/Standards

G-OLE

1. The 75 percent standard for drug interdiction was established at or prior to July, 1977 and was included in the FY79-80 OPP. A GAO study, the Coast Guard Role in Drug Interception -- How Much is Enough? (printed 12 FEB 81), noted that "while the Coast Guard has established a general goal for its law enforcement mission of detecting and deterring 75 percent of law enforcement violations over the ten year period 1981-1990, in our opinion a more fully defined drug interdiction goal is needed to measure its effectiveness."

2. The current program standard of detecting 75 percent of the sea-born drug traffic is merely a reasonable interdiction goal at which the maritime marijuana smuggling industry may be seriously disrupted. This standard represents an approximate break-even point between the smuggler's perceived costs and profits. This can be described as the point where the level of detections causes sufficient costs to offset the profit incentive. The smuggler or potential smuggler is thus deterred from this illegal activity. Enclosures (1) and (2) provide the rationale behind this standard.

3. Enclosure (1) provides an interdiction model based on the economic effect of interdiction on the financier of a marijuana smuggling enterprise. It points out that a 75 percent interdiction rate is a conservative goal in light of the uncertainties associated with marijuana price ratios and the impact of other deterrent factors such as legal sanctions. For example (using figure 2), if the price ratio of selling to buying is 10:1, then a 87 percent interdiction rate would be necessary to reach the goal of the .25 rate of return on an investment. Any deterrent factors could have the apparent effect of reducing the price ratio and thus lower the required interdiction rate.

4. Enclosure (2), attachment (2), provides a numeric example of a smuggler's cash flow when experiencing 50 percent and 75 percent interdiction.

B. V. HUNTER

ENCL: (1) Appendix XVI to Coast Guard Military Personnel Requirements Study (FOUO), pgs XVI-8 to XVI-17
(2) G-CPE memo to G-O dtd 30 OCT 1979

LT HUNTER:spf:12/8/81

ALSO See CNA Study Executive Summary

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to stash sites in the Bahamas etc., to avoid the increasing risk of interdiction which appears to grow as Coast Guard efforts increase. Therefore, one can conclude that without Coast Guard drug enforcement efforts, little to no marijuana would be interdicted at sea.

The Coast Guard, in determining the desired level of interdiction (program standard) has done so in support of the Federal Strategy and in an effort to impact the profits associated with drug trafficking. The National Narcotics Intelligence Consumers Committee in the Narcotics Intelligence Estimate states that the marijuana interdiction rate for 1978 (although high as compared to previous years) was insufficient in attempting to cripple the marijuana trade, and that in fact, smugglers could lose four out of five marijuana shipments (80 percent) and still make a profit.[23] The Coast Guard, while interdicting 20 percent and 15 percent of marijuana shipped by sea in 1978 and 1979 respectively, has set as its objective the detection or deterence of 75 percent of the potential violations of federal laws and international agreements relating to illicit seaborne trafficking of drugs. By interdicting 75 percent as opposed to 20 percent of the marijuana shipped by sea, approximately 4,139 metric tons valued at about $6,023 million would not have entered the United States illegally in 1978.[24] (The deterent effect is discounted in the preceding estimates. It is reasonable to assume that deterence would result in a smaller quantity of marijuana shipped by sea. This in turn would mean that less marijuana would be seized at a given rate of interdiction. The relationship between a change in Coast Guard drug enforcement activity levels and a corresponding change in the volume of marijuana shipped by sea has not been quantified. Therefore, in the development of the interdiction model which follows, the effects of deterence are disregarded.)

The following analysis is a presentation of an interdiction model which displays possible scenarios of levels of interdiction and profits which one could expect, given the assumptions described. This model further supports the Coast Guard objective of interdicting 75 percent of all marijuana shipped by sea to the U.S.

Interdiction Model

One can argue that a drug trafficker operates on a profit motive and that an economic model is appropriate for evaluating the efforts of Coast Guard enforcement activity upon the profit expectation of the trafficker. The basic idea behind the model presented below is that traffickers will continue to operate as long as a certain return on investment is met or exceeded. If the return on investment falls below a threshold value, (the Coast Guard is assuming a threshold value of 25 percent) traffickers will seek to obtain an acceptable return on investment from some other source. A Coast Guard objective is to achieve a 75% rate of interdiction. This will reduce the traffickers return on investment below the threshold value (25 percent), and could eliminate the maritime shipment of marijuana.

The following assumptions are made in the model:

a. The quantity of marijuana shipped by sea remains constant.

b. The cost per unit of marijuana at the source remains constant.

ENCLOSURE(1)

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c. The unit selling price of marijuana obtained by a trafficker remains constant.

d. There is no cost to the trafficker other than the acquisition cost of the marijuana shipped by sea.

e. The minimum rate of return on investment demanded by all traffickers is the same, and at a lesser rate of return on investment no marijuana will be shipped by sea.

The following variables are used in the model:

M = quantity of marijuana that commences shipment by sea.

C = cost per unit of marijuana at the source.

Q = quantity of marijuana that the traffickers successfully deliver by sea.

S = unit selling price of marijuana obtained by the trafficker.

I = interdiction rate; the fraction of marijuana shipped by sea that is interdicted (1- Q/M).

R = price ratio; ratio of unit selling price to unit cost of marijuana.

P = rate of return on investment; fraction of investment that is returned as profit.

T = amount of investment by the trafficker in marijuana shipped by sea.

G = gross sales; revenue from selling non-interdicted marijuana.

N = net profit; excess of gross sales over cost of marijuana.

From the investment perspective, the trafficker's investment (T) is used to purchase marijuana which is later sold at a profit. Therefore,

$$T = CM \qquad (1)$$

The gross sales are the product of the selling price and the quantity successfully delivered. Assume that the amount shipped, M, is constant. Then, with interdiction rate (I), the amount delivered is,

$$Q = (1-I)M \qquad (2)$$

and the gross sales are

$$G = QS$$

$$= (1-I)MS \qquad (3)$$

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The price ratio (R) is simply the selling price divided by the cost (S/C) or

$$S = RC \qquad (4)$$

The net profit (N) is the difference between the gross sales and the investment, or

$$\begin{aligned} N &= G - CM \\ &= QS - CM \\ &= (1-I)MRC - CM \\ &= ((1-I)R-1)\,CM \end{aligned} \qquad (5)$$

The trafficker's return on investment is the net profit, and the rate of return is the net profit divided by the investment, or

$$P = N/T \qquad (6)$$

Substituting equations (1) and (5) into (6) yields,

$$\begin{aligned} P &= \frac{((1-I)R-1)CM}{CM} \\ &= (R-1) - RI \end{aligned} \qquad (7)$$

Thus the rate of return on investment varies linearly with the interdiction rate for a constant price ratio. Several relationships are shown in figures 2 and 3.

Equation (5) displays the net profit (return on investment) as a function of the interdiction rate, price ratio, cost of marijuana and the amount of marijuana shipped by sea. If one does not carry the equation through as described above, one may easily be misled. For example,

$$\begin{aligned} N &= G - CM \\ &= QS - CM \\ &= QS - S/R\ \frac{Q}{(1-I)} \\ &= QS\,(1-(1/R(1-I))) \end{aligned} \qquad (8)$$

If equation (8) is plotted as in figure 4, the net profit appears to vary nonlinearly with the interdiction rate. However, if the amount of marijuana shipped by sea, (M), is held constant as assumed, then the amount delivered (Q) decreases with an increasing interdiction rate. Q is a function of I under the conditions assumed, and the effect upon the net profit of an increasing interdiction rate can only be seen clearly when the net profit is displayed as a function of the constant investment (CM). The net profit (N) as a fraction of the investment (CM) is linear as shown in figure 5.

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The above development assumed that the amount of marijuana shipped by sea was a constant and that interdiction reduced the amount delivered thereby reducing the return on the fixed investment. An alternative approach is to assume that the amount delivered is a constant and that the trafficker will increase the investment and ship increased amounts to offset higher interdiction rates until the rate of return on the amount invested falls below the threshold value. The investment cost is now

$$T = CM$$

$$= \frac{CQ}{(1-I)} \qquad (9)$$

The gross sales are,

$$G = QS \qquad (10)$$

The net profit is,

$$N = G - T$$

$$= QS - \frac{CQ}{1-I}$$

$$= QRC - \frac{QC}{1-I}$$

$$= QC\ (R - (1/1-I)) = Q\frac{S}{L}\left[1 - \frac{1}{(1-I)}\right] \qquad (11)$$

Finally, the rate of return is. $= \left[1 - \frac{1}{1 \cdots}\right]$

$$P = N/T$$

$$= \frac{QC\ (R - (1/1-I))}{QC/(1-I)}$$

$$= R(1-I) - 1 \quad - \quad (1 - \cdots - \cdots \qquad (12)$$

Note that equation (11) for the net profit translates to equation (8); and, hence, the curve in figure 4 represents the net profit when the amount delivered (Q) is held constant. Of particular interest is the observation that equation (12) is exactly equation (7). Hence, the relationship between the rate of return, price ratio and interdiction rate is the same using either approach to the model, (constant amount shipped or constant amount of marijuana delivered).

Using figure 2 of the model, one can see that for any price ratio less than or equal to R=5, 75 percent interdiction is the maximum level of effort needed for the trafficker's rate of return on investment to fall below the threshold value of 25 percent. Price ratios greater than R=5 would require some rate of interdiction greater than 75 percent. The Coast Guard objective of detecting or deterring 75 percent of the marijuana imported by seaborne trafficking should be recognized as a somewhat conservative estimate of required interdiction efforts in light of the uncertainty associated with marijuana price ratios and the likelihood that it is greater than R=5.

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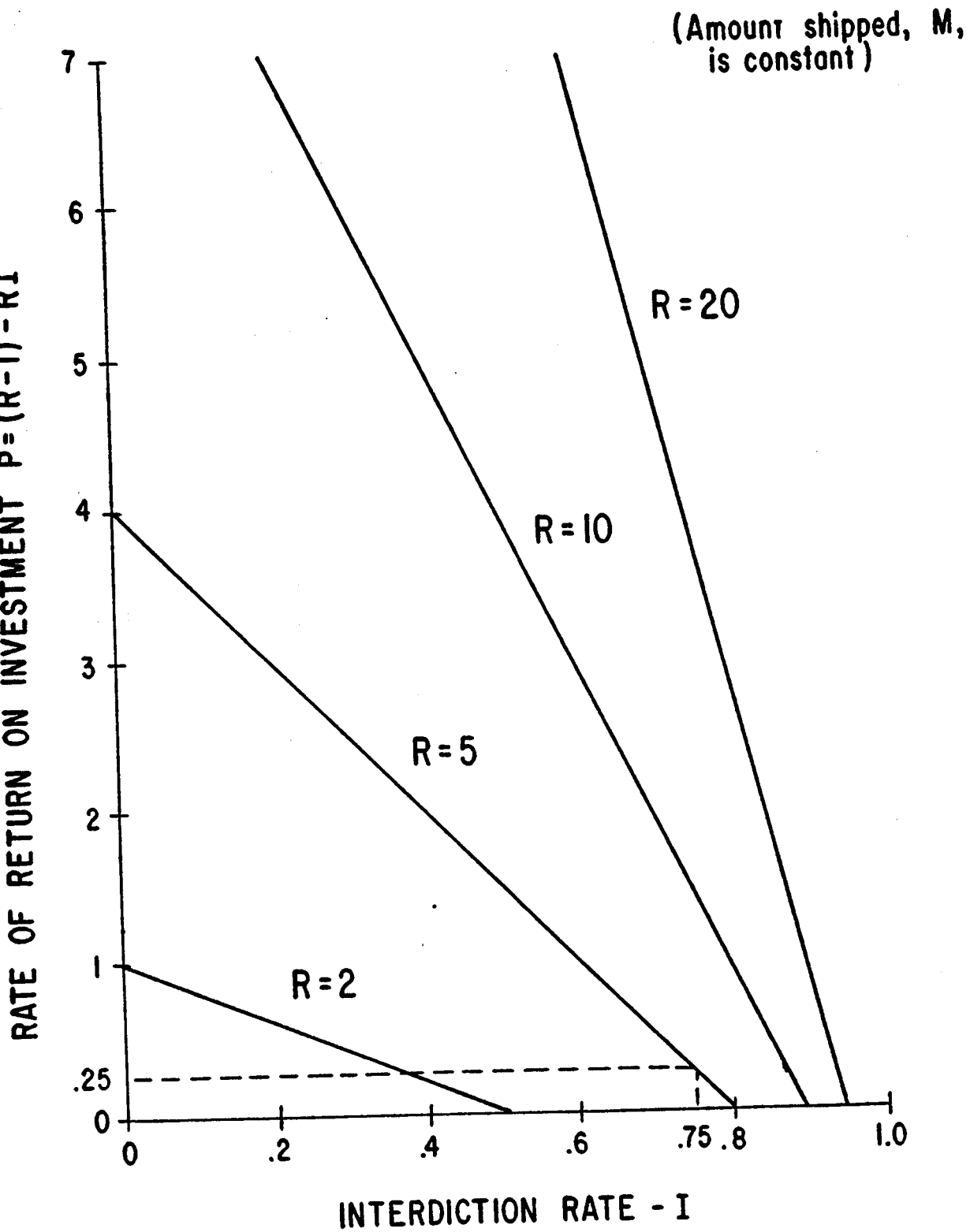

Figure 2

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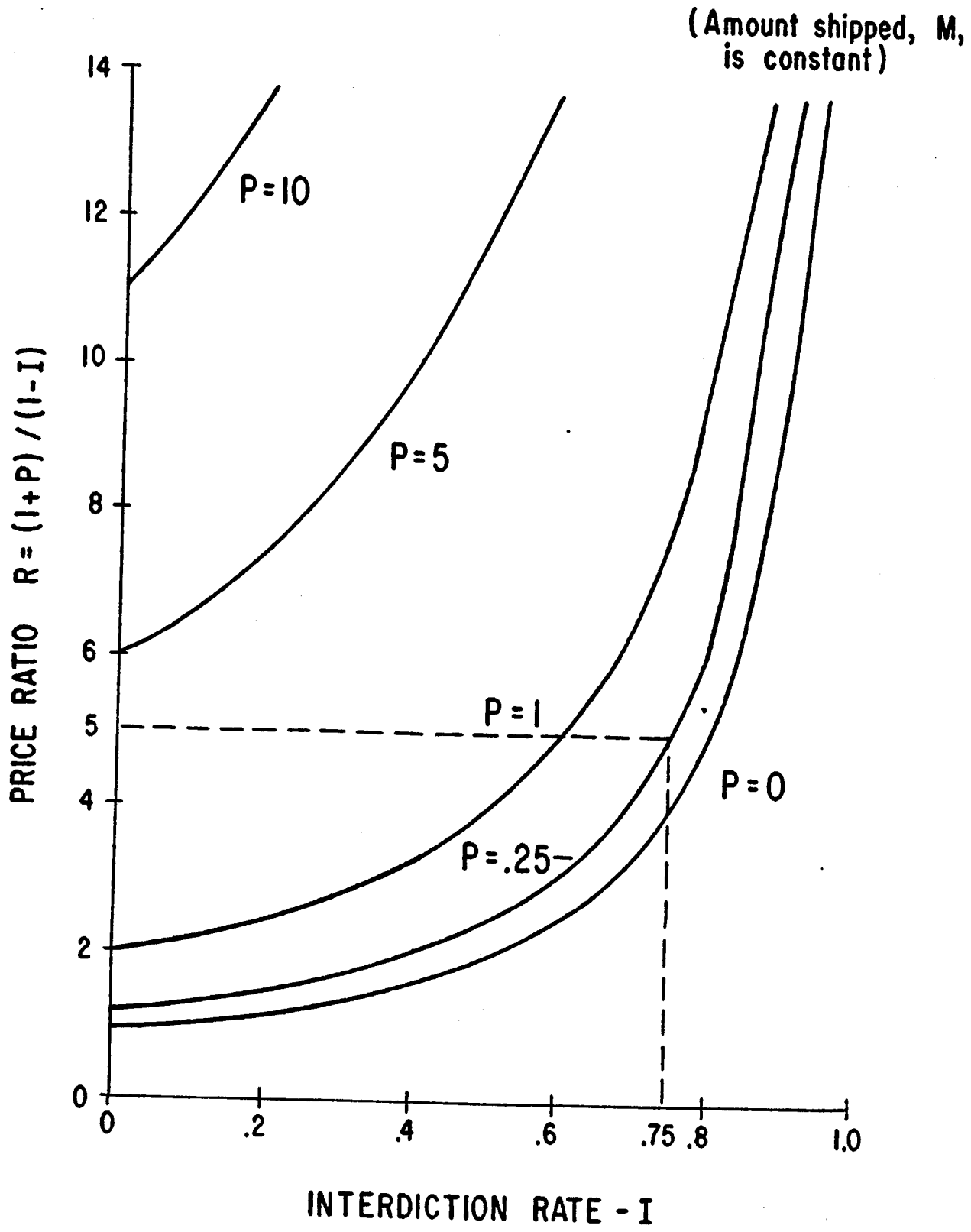

Figure 3

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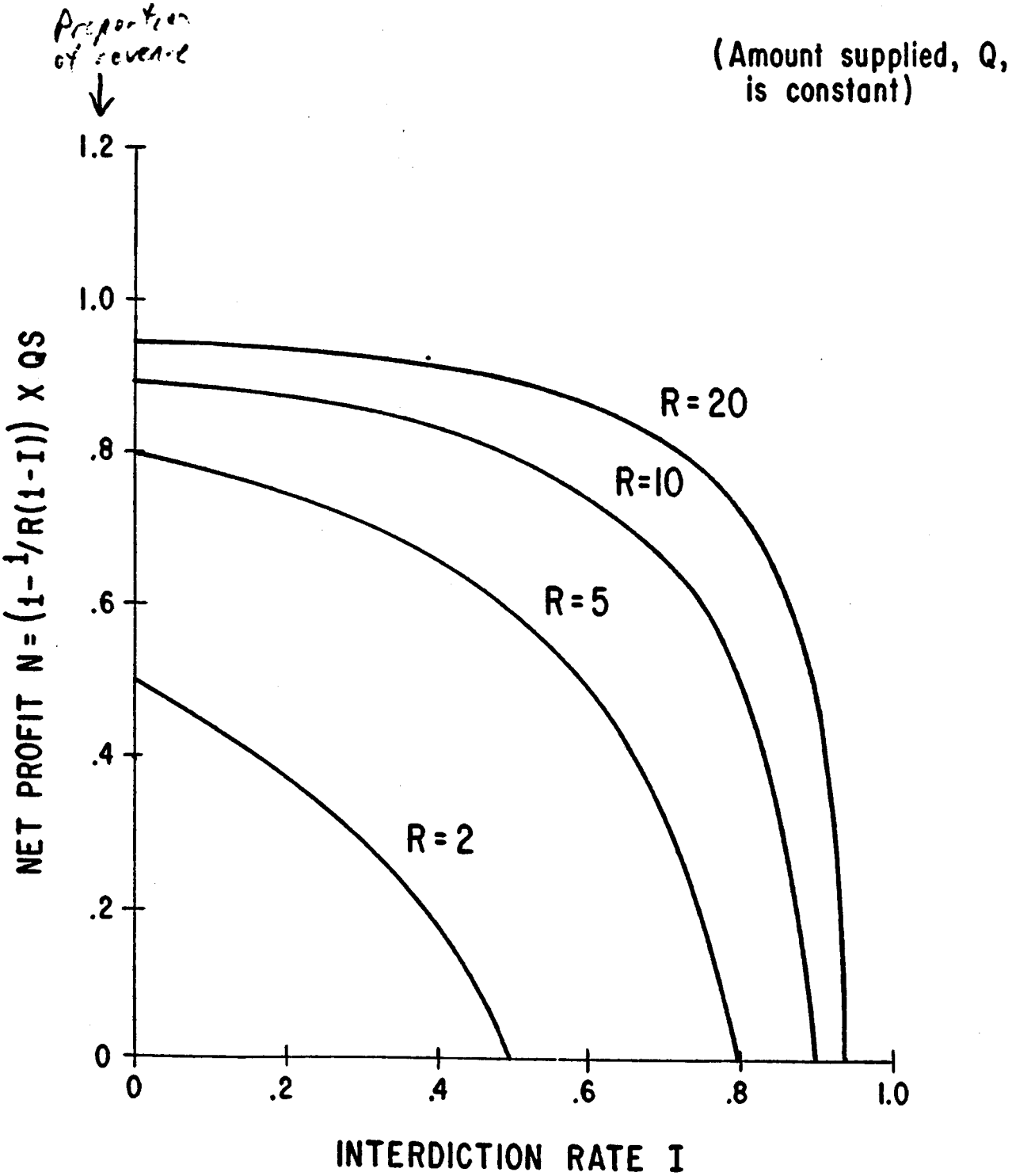

Figure 4

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(Amount shipped, M, is constant)

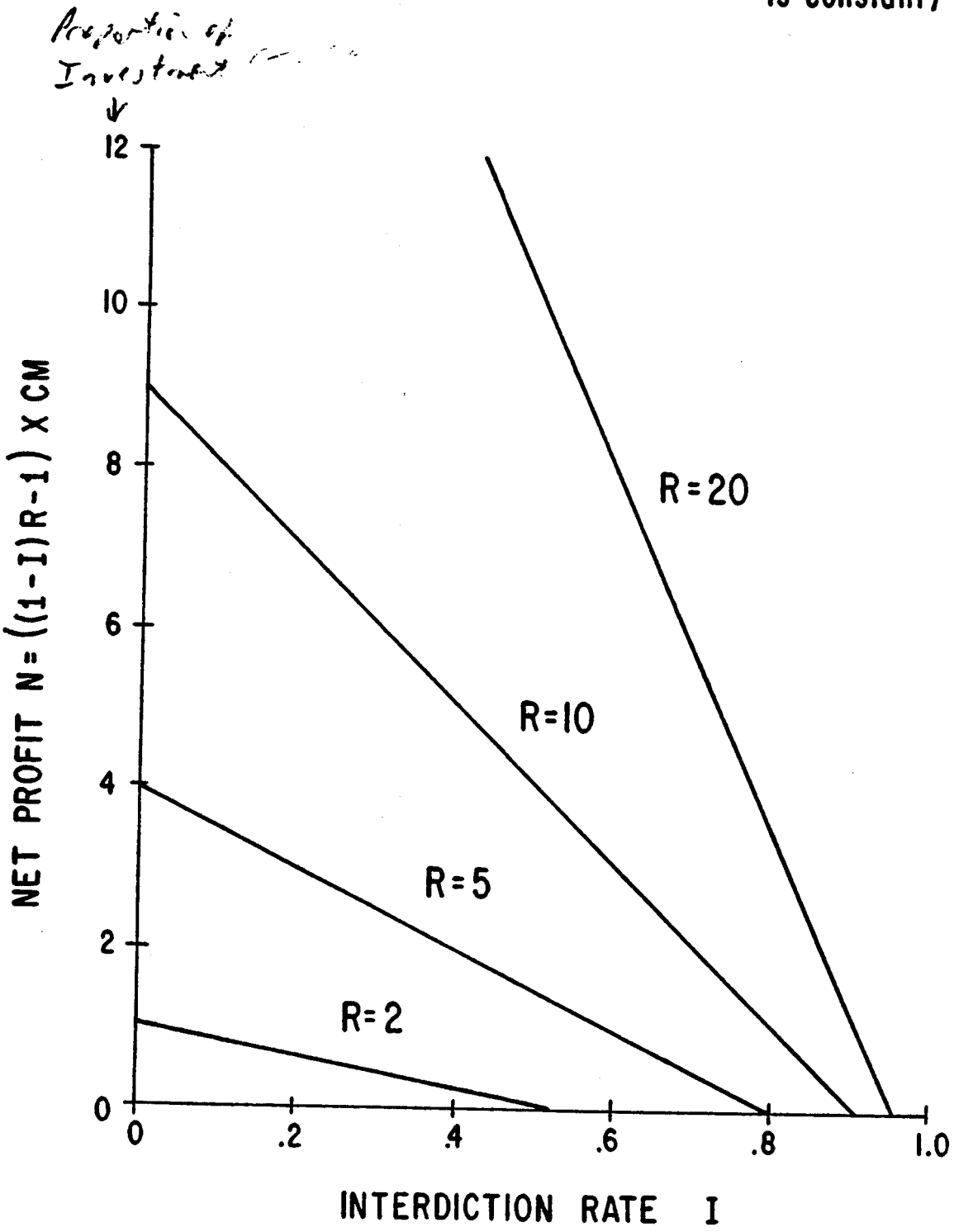

Figure 5

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FOOTNOTES

APPENDIX XVI (FOUO)

[1] U. S. Department of Transportation, U. S. Coast Guard, Spring Preview, FY 1980 (Washington, D. C., 1978), pp.48-49.

[2] Strategy Council on Drug Abuse, Federal Strategy for Drug Abuse and Drug Traffic Prevention: 1979 (Hereinafter referred to as Federal Strategy) (Washington, D. C.: U. S. Government Printing Office, 1979), p. 4.

[3] Ibid., pp. 32-33, 59.

[4] National Narcotics Intelligence Consumers Committee (Hereinafter referred to as NNICC), Narcotics Intelligence Estimate (Washington, D. C., 1979), p. 90.

[5] Ibid., pp. 90-91.

[6] Ibid., p. 92.

[7] National Institute on Drug Abuse, Marijuana and Health: Eighth Annual Report to the U. S. Congress from the Secretary of Health, Education and Welfare (Hereinafter referred to as Marijuana and Health) (Washington, D. C.: U. S. Government Printing Office, 1980), pp. 3-4.

[8] NNICC, Narcotics Intelligence Estimate, pp. 47, 111.

[9] NNICC, Narcotics Intelligence Estimate, p. 6.

[10] National Institute on Drug Abuse, Marijuana and Health, p. 2.

[11] All data used in table 1 are from the National Institute on Drug Abuse, Marijuana and Health, p. 2.

[12] National Institute on Drug Abuse, Marijuana and Health, p. 4.

[13] National Institute on Drug Abuse, Marijuana and Health, p. 4.

[14] National Institute on Drug Abuse, Marijuana and Health, p. 4.

[15] National Institute on Drug Abuse, William Pollin, M.D., Director, Statement of William Pollin, M.D., before the Select Committee on Narcotics Abuse and Control, House of Representatives, on the Health Consequences of Marijuana Use (Washington, D. C., July 19, 1979), p.2.

[16] Ibid.

[17] NNICC, Narcotics Intelligence Estimate, p.6.

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[18] These data represent the mid-point of the range of marijuana estimated to be imported to the U. S. These data do not include domestic production. Data derived from NNICC, Narcotics Intelligence Estimate, p.105.

[19] NNICC, Narcotics Intelligence Estimate, p. 90.

[20] U. S. Coast Guard, Office of Operations, Operational Law Enforcement Division. It is important to note that the 1978 dollar value of marijuana, $1,206 million, is a Coast Guard estimate based on an average price of $23 per ounce of marijuana. Since most of the marijuana is believed to be imported from Colombia and NNICC has estimated that the average price of Colombian marijuana in 1978 was $45 per ounce, it is reasonable to assume that the Coast Guard estimate in dollar value is vastly underestimated. A more accurate average price for the Coast Guard to have used would have been approximately $40 per ounce.

[21] U. S. Coast Guard, Office of Operations, Operational Law Enforcement Division. The dollar value of marijuana in 1979, $1,640 million, is an estimate based on an average price of $40 per ounce of marijuana.

[22] U. S. Coast Guard, Office of Operations, Operational Law Enforcement Division. The 1980 dollar value of marijuana is based on an average price of $40 per ounce of marijuana.

[23] NNICC, Narcotics Intelligence Estimate, p. 47.

[24] The dollar value of the marijuana that would not have entered the U. S. illegally in 1978, $6,023 million, is based on an average price of approximately $41 per ounce. If one were to attempt to derive the $6,023 million value by using the value of the amount interdicted in 1978, one should be cautioned that the interdicted value is based on an average price of $23 per ounce and therefore would have to be adjusted as described in footnote 20, before the data can be used in deriving the $6,023 million figure.

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CENTER FOR NAVAL ANALYSES

DRUG INTERDICTION OPERATIONS BY THE COAST GUARD: SUMMARY

INTRODUCTION

This report describes the results of the first year of a planned 2-year study of Coast Guard drug interdiction operations. The study was done for the Office of Operations, U.S. Coast Guard Headquarters, under contract DOT-CG-831468-A. The purpose of the study and the tasks to be performed are detailed in the "statement of work," which is reproduced as Appendix A. References 1 and 2 present details of our work and of our findings.

Because of its bulk, marijuana is the contraband drug most susceptible to interdiction by the Coast Guard. In fact, marijuana was involved in 99 percent of the cases we examined. Accordingly, references 1 and 2 are concerned only with operations against marijuana smugglers.

Reference 1 presents our analysis of the tasks involved in drug interdiction operations and our model of those operations, and explains how to use the model to examine alternative tactics and forces. The inputs to the model are based on Coast Guard records, including data from files on 206 seizures that occurred during 1977-78.

Reference 2 describes the data base we developed from the 206 seizures and presents our analysis of the data. The analysis was focused as follows:

- Areas in which smuggling vessels were located.
- Methods--including intelligence and surveillance--involved in locating smuggling vessels.
- Types of vessels seized, their characteristics, and the amounts of drugs they carried.
- Types of Coast Guard units involved.

This report first presents our analysis of the drug interdiction problem. Then we summarize our analysis of the tasks involved in patrol operations, from reference 1, and the results of drug interdiction operations, from reference 2. Finally, we make recommendations in three areas: a system for collecting more complete data on drug interdiction operations; topics for further analysis; and selection criteria for boarding vessels.

THE PROBLEM

Estimates of marijuana shipments by sea to the U.S. center on an annual rate of 8,000 tons (reference 3). These estimates are for

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1977, when the Coast Guard seized about 600 tons of marijuana. In the last three quarters of 1978 the Coast Guard increased its annual interdiction rate to 2,000 tons, or 25 percent of the earlier shipment rate. However, we don't know if the rate of shipments also changed.

If the Coast Guard should further increase its rate of interdiction of marijuana shipped by sea, the smugglers can either accept the higher interdiction rates or find ways to avoid interdiction. Smugglers may decide to accept higher interdiction rates and

- Absorb their losses to interdiction by accepting smaller profits, or
- Raise the selling price of marijuana to try to offset the cost of marijuana that is interdicted.

These actions are not mutually exclusive and either or both might accompany the steps that smugglers could take to avoid interdiction.

Though we have not undertaken a complete analysis of the many options available to smugglers we have analyzed the relationship between interdiction rate, profits, and the price of marijuana. In the analysis we make the following assumptions:

- The supply of marijuana expands with interdiction rate to allow a constant rate of delivery to the U.S.
- The unit cost of marijuana to the smugglers remains constant.
- Marijuana purchases comprise most of the costs incurred by smugglers.

If smugglers are willing to absorb the losses caused by interdiction, the selling price will not be affected by the interdiction rate. However, the effect of the interdiction rate on the gross profit smugglers might realize is sensitive to the ratio (R) of the price at which smugglers can sell marijuana to the price at which they buy it. Based on 1978 data obtained from the Drug Enforcement Agency (DEA) the value of R appears to be about 5. Because of wide variations in the data we use values for R of 10, 5, and 3 in our analysis.

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Figure 1 shows how the potential gross profit varies with the interdiction rate and price ratio (R), given the assumptions previously stated.[1]

Figure 1 indicates that R has a strong effect on potential gross profit and that a high interdiction rate may be required before profits are substantially affected. At an interdiction rate of 20 percent and a price ratio of 5, smugglers' profits might be only 6 percent lower than they would be without interdiction. The interdiction rate might have to rise to 50 percent to cause a 25 percent reduction in profits, at a price ratio of 5.

If the quantity of marijuana sold by smugglers were unaffected by an increase in the price they charge, smugglers could offset their losses to interdiction by increasing the selling price as the interdiction rate increased. Figure 2 shows the amount the selling price would have to increase to realize a constant profit

---

[1]The percent of zero interdiction gross profit (figure 1) is computed as follows:

$$\frac{P_I}{P_O} = \frac{T(B-a) - \left[\frac{(T)}{1-I}\right]\left[IA\right]}{T(B-a)} \times 100 = \frac{R - \left[\frac{1}{1-I}\right]}{R-1} \times 100$$

where:

P_O = potential gross profit for zero interdiction

P_I = potential gross profit with interdiction

I = fraction of shipped marijuana interdicted

T = tons of marijuana delivered to U.S.

A = buying price per ton

B = selling price per ton

R = B/A.

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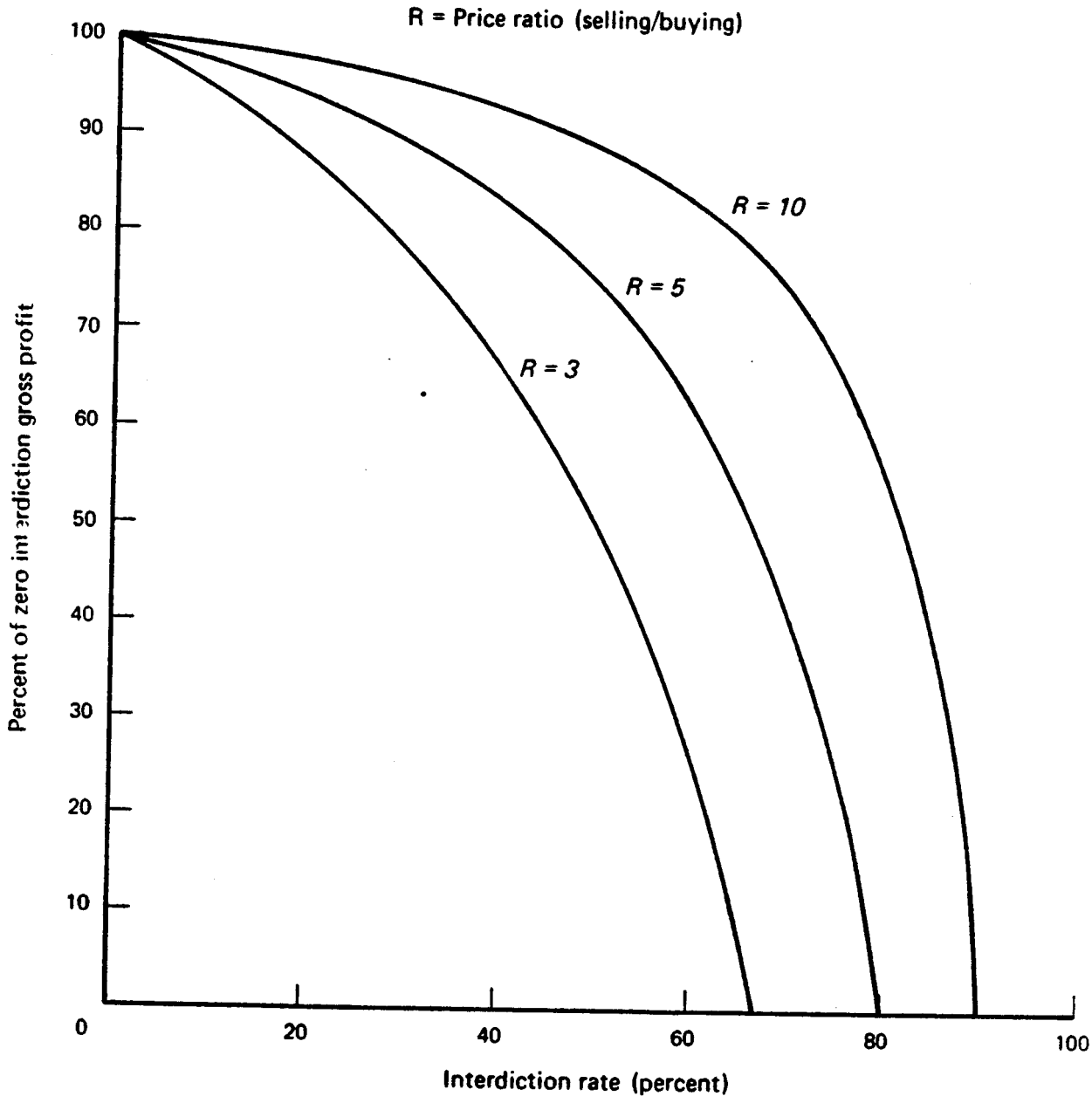

FIG. 1: EFFECT OF INTERDICTION RATE ON NORMALIZED POTENTIAL GROSS PROFIT

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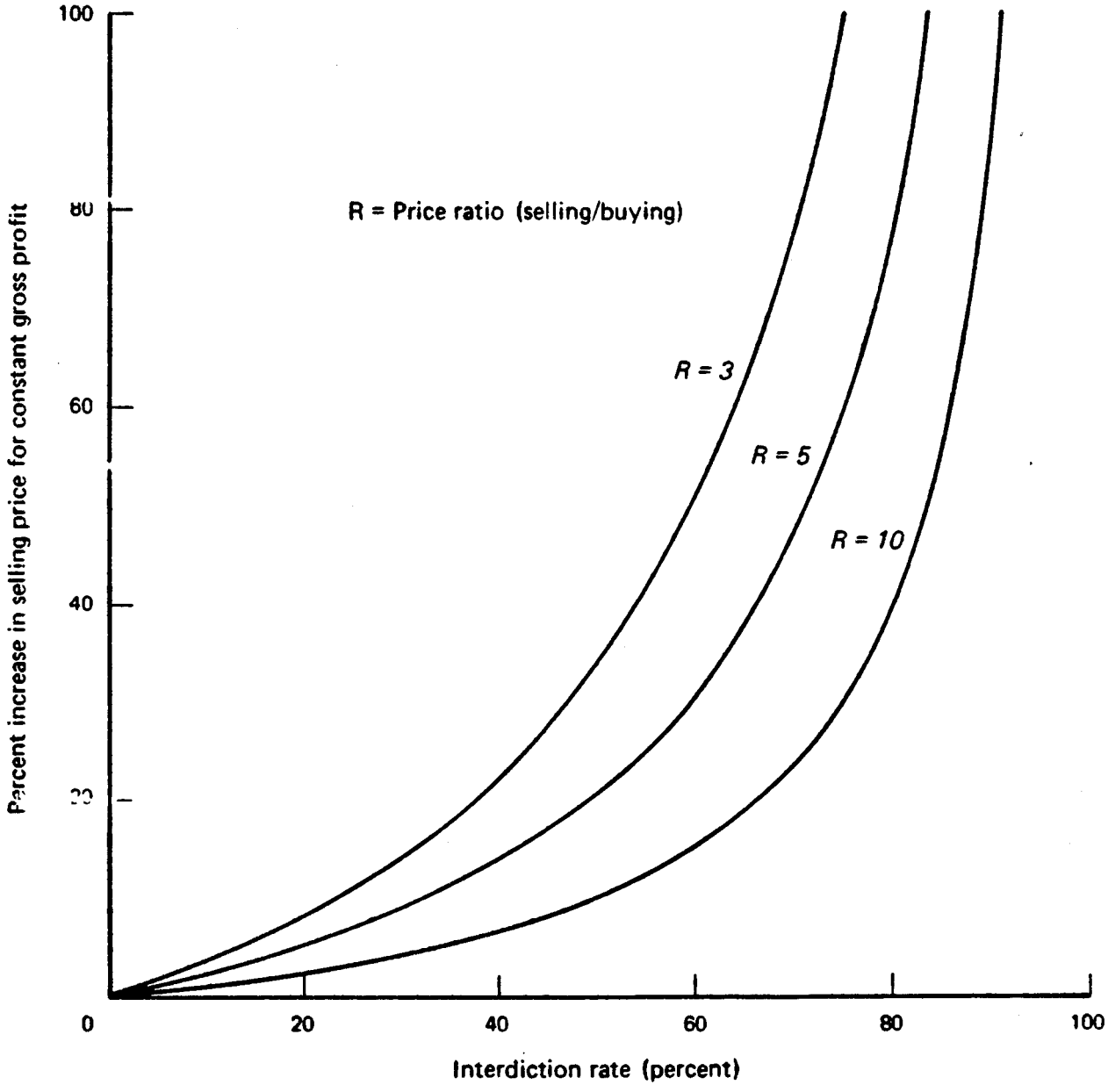

FIG. 2: EFFECT OF INTERDICTION RATE ON SELLING PRICE

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as the interdiction rate increases.[1] Again, the results are sensitive to the price ratio, R. For a price ratio of 5, a 20 percent interdiction rate would require a price increase of only 5 percent; if the interdiction rate were to rise to 55 percent then a 25 percent increase in price would be required.

The amount of marijuana users would be willing to buy would, of course, be affected to some extent by price. However, at a Coast Guard interdiction rate of, say, 30 percent or less smugglers might have to realize a rather small price increase to maintain a constant gross profit. This suggests that an interdiction rate in the realm of the Coast Guard's accomplishments of 1977-78--although impressive--need not have much effect on the selling price of marijuana. This, along with the apparent ability of smugglers to absorb the losses stemming from fairly high interdiction rates, may explain why "seizures during 1978 of over 2,000 tons--had no discernible impact on domestic retail prices" (reference 3).

Rather than accept higher interdiction rates, smugglers can attempt to counter the Coast Guard's efforts by changing their own modes of operation. The following are examples of changes:

- Improving tactics, such as improved surveillance or intelligence of Coast Guard operations or the use of smaller smuggling vessels as "decoys."
- Changing sea routes, including transshipment to intermediate depots.
- Shipping more marijuana by air.
- Shifting to other countries as sources of marijuana.

The degree to which such changes would be adopted would depend on the extent to which smugglers' profits were being affected and how smugglers perceived the difficulty, expense, and effectiveness of the changes. Our analysis suggests that even at the 1978 interdiction rate smugglers probably weren't forced to make drastic changes in their modes of operation. Unless the interdiction rate is substantially increased over the 1978 level, the present modes of smuggling operations can be expected to continue without much change.

---

[1]The percent increase in selling price (figure 2) is computed by the following equation:

$$k_I = \frac{100I}{R(1-I)} \quad .$$

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Even though the interdiction rate may increase, the rapidity of the increase may be critical. For example, a large, sudden increase could drive up the short-run selling price of marijuana. But this increase would benefit only those smugglers clever enough or lucky enough to be caught infrequently. On balance, the effect of the sudden rise might be to force a sizable fraction of smugglers out of business and, at least temporarily, discourage potential replacements.

On the other hand, a steady but slow rise in the interdiction rate could give smugglers an opportunity to secure new supplies of marijuana, sources of smuggling vessels, and reliable crews. In the process they might begin treating losses to interdiction as a predictable cost of operation. Smugglers would also have a chance to gauge the long-run growth rate in the demand for marijuana, which will largely determine whether it is worthwhile to absorb the costs of a higher interdiction rate. Moreover, smugglers may estimate that the Coast Guard will not be able to increase its seizures as rapidly as marijuana shipments increase.

Regardless of what happens to the interdiction rate, smuggling may increase if smugglers foresee a large, long-run increase in demand and anticipate relatively low costs of operation. This does not mean that efforts to improve the Coast Guard's drug interdiction operations would be in vain. On the contrary, a lack of progress might encourage even more smuggling.

ANALYSIS OF PATROL OPERATIONS

The analysis reported in detail in reference 1 serves three main purposes:

- Identifies the major tasks involved in drug interdiction patrols.
- Provides a model that can be used to generate patrol profiles and to examine the effects of changes in patrol procedures or changes in the level and mix of resources allocated to drug interdiction. (Ten examples of the use of the model are presented in reference 1.)
- Indicates tasks that take a large proportion of patrol time, which, if made more efficient, could significantly improve patrol effectiveness.

We considered in detail only that portion of a patrol associated with general search for smuggling vessels. The time involved in transit and in diversions to other operations such as search and

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